J Enzyme Inhib Med Chem. 2009 Oct;24(5):1076-81. doi: 10.1080/14756360802632658.

Dual effects of aliphatic carboxylic acids on cresolase and catecholase reactions of mushroom tyrosinase.

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Abstract

Catecholase and cresolase activities of mushroom tyrosinase (MT) were studied in presence of some n-alkyl carboxylic acid derivatives. Catecholase activity of MT achieved its optimal activity in presence of 1.0, 1.25, 2.0, 2.2 and 3.2 mM of pyruvic acid, acrylic acid, propanoic acid, 2-oxo-butanoic acid, and 2-oxo-octanoic acid, respectively. Contrarily, the cresolase activity of MT was inhibited by all type of the above acids. Propanoic acid caused an uncompetitive mode of inhibition (K(i)=0.14 mM), however, the pyruvic, acrylic, 2-oxo-butanoic and 2-oxo-octanoic acids showed a competitive manner of inhibition with the inhibition constants (K(i)) of 0.36, 0.6, 3.6 and 4.5 mM, respectively. So, it seems that, there is a physical difference in the docking of mono- and o-diphenols to the tyrosinase active site. This difference could be an essential determinant for the course of the catalytic cycle. Monophenols are proposed to bind only the oxyform of the tyrosinase. It is likely that the binding of acids occurs through their carboxylate group with one copper ion of the binuclear site. Thus, they could completely block the cresolase reaction, by preventing monophenol binding to the enzyme. From an allosteric point of view, n-alkyl acids may be involved in activation of MT catecholase reactions.

PMID: 19555185 DOI: 10.1080/14756360802632658

[Indexed for MEDLINE]